

THE CUTTLE-FISH "BONES" OF THE SYDNEY BEACHES.

(PHYLUM MOLLUSCA—CLASS CEPHALOPODA).

By TOM IREDALE.

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(Plates xxi.-xxiii.).

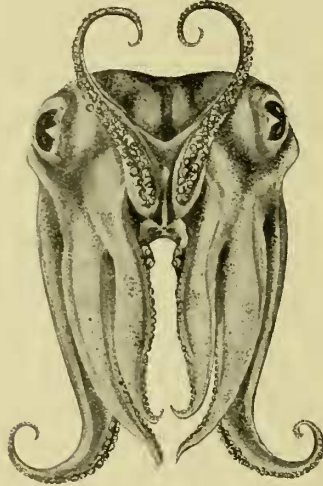


Fig. 5. Front view of *Solitosepia plangon*, waiting for its prey.

No molluscan "shells" represented in the Sydney Fauna appear to have been so neglected as the present group. A common object on every beach all through the year, no attempt at classifying the various forms has hitherto been made. This is mainly due to the fact that the complex makers of the "bones" have been regarded as difficult to study, and the "hone" itself has been considered a secondary matter of little importance, which has thus escaped serious attention. The "bones" are at times abundant on the Sydney beaches, and some specimens may be picked up at any time: it would appear that these beaches constitute one of the richest hunting grounds in the world. So many different forms have been investigated that a novel treatment is here suggested: this was necessitated by a study of the literature of the subject, and a survey of the species from the rest of Australia. Consequently, while this essay fulfils the primary scope of the inquiry, the corollary is a survey of the cuttle fishes of Australia, which will be later published. In the fuller account the animals, as well as the hones will be dealt with in detail, and the technicalities, which have developed, comprehensively demonstrated.

I will here simply provide a summary of the "hones" that may be picked

up on these beaches, but which constitute the known faunula of this State. The Sydney beaches include all the beaches between Broken Bay and Botany Bay, and all the species have been found on these, but as hereafter shown some species are much commoner in the north, while others are better represented in the south of the State. In this inquiry I have been assisted by many friends, all of whom are sincerely thanked, and for especial thanks I may signal out Mr. A. F. Basset Hull, who has collected for me many specimens from Queensland and New Caledonia, Mr. G. MacAndrew, who made very large collections at Shell Harbour, Mr. H. Mort, who searched Jervis Bay, Mr. A. O'Sullivan, who gathered a fine lot at the Richmond River rocks, and Mr. G. P. Whitley, of the Australian Museum, who has searched the beaches south of the Sydney Heads, while I have patrolled those to the north. Altogether some thousands of specimens have been critically examined from this State alone, so that a reliable working basis can be safely provided.

The history of the group in Sydney literature is somewhat brief. As long ago as 1849, cataloguing the mollusca in the British Museum, Gray included two species from Sydney, one of which he named as a new species. Later, when Angas listed the Mollusca of Port Jackson in 1867, 1871, 1877, his only note reads, "Species of *Sepia*, etc., occur on the coast of New South Wales, but at present they appear to be unidentified." Dealing with the material collected by the "Challenger," Hoyle introduced a new species from deep water off Twofold Bay, N.S.W., and figured one of Gray's previously described species. When Whitelegge catalogued the Invertebrate Fauna of Port Jackson and neighbourhood in 1889 four species were listed, while Brazier in 1892 collated five from New South Wales, but only four from Port Jackson. Hedley, in 1908, added another species, and in 1918 recorded five species only. The present account registers fourteen species, of which eight may be regarded as common.

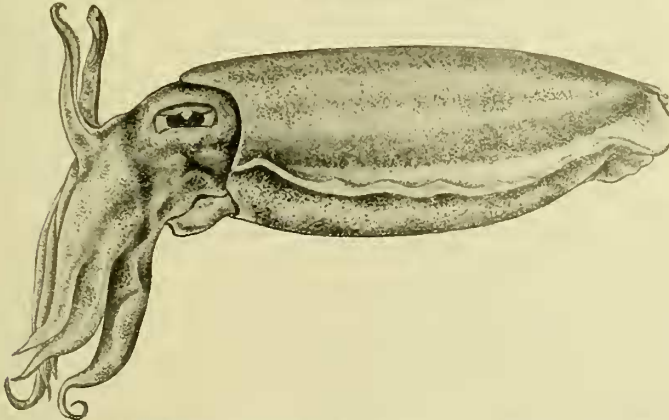


Fig. 6. Side view of *Solitosepia plangon* in swimming attitude. waiting for its prey. Long tentacles concealed.

The animal which is responsible for these "hones" is a Cephalopod—with eight arms and two longer tentacles—which swims only. Externally these animals are comparatively generalised, so that hitherto little has been done in connection with the determination of their interrelationships, but from study of the hones I suggest inquiry would indicate valid differences equivalent to the obvious

ones seen in related families. I have examined animals of half of the species represented in the Australian fauna, and propose to describe them in my larger essay, so here only give a couple of illustrations so that if an animal he met with it may be recognised and the bone will absolutely determine the species.

The "bones" are so numerous that the majority are recognisable at sight when the distinguishing characters are known. A crude method of tabulating them by means of sizes may be mentioned as there is one extremely large one, two or three rarer large forms, the majority of medium size and a couple of very small narrow ones.

An artificial key can be arranged on other features as:—

Inner cone large, shell medium, spine keeled	<i>Solitosepia</i> .
spine not keeled	<i>Mesembrisepia</i> .
Inner cone missing, shell medium, spine keeled	<i>Glyptosepia</i> .
spine rounded	<i>Decorisepia</i> .
shell very small and narrow, spine rounded	<i>Arctosepia</i> .
Inner cone produced as a glaze and spine missing in adult	<i>Amplisepia</i> .
Inner cone produced ventrally as a ledge	<i>Acanthosepion</i> .

Genus SOLITOSEPIA, nov.

Shell of medium size, the inner cone well developed, the spine keeled. While these features distinguish this group the members disagree in other details so much that the species may not prove congeneric later. The species selected as type, *S. liliana*, is the broadest one, while *S. plangon*, in addition to being the narrowest, shows reduction of the inner cone. This group is characteristic of the Peronian region as though four species are here included, two are at present only known from that region, and the other two have not a wide extralimital range.

An artificial key may be presented thus:—

Shell broad, hack not ribbed	<i>S. liliana</i> .
medium, hack not ribbed	<i>S. mestus</i> .
larger, hack ribbed	<i>S. rozella</i> .
smaller and narrow, hack ribbed	<i>S. plangon</i> .

As confirmatory characters, the back of the firstnamed is chalky-white, while that of the second is cream: neither show a median ventral sulcus. The third has a very deep ventral sulcus and a prominent rose inner cone. The last is narrow, a long deep ventral sulcus, and inner cone more or less obsolete.

SOLITOSEPIA LILIANA, n.sp.

Plate xxi., fig. 1-3.

Shell of medium size, regularly oval, about twice as long as broad, a short prominent spine produced backwards and bearing a keel ventrally: dorsal surface not ribbed, nor ventral surface anteriorly swollen, nor sulcate.

Dorsal surface wholly calcareous, bluish or chalky-white in colour, finely irregularly pustulose, the pustules becoming coarse on each side towards the spine, while a series of indistinct rays may be seen radiating from the spine anteriorly.

Ventral surface flattened anteriorly, excavate posteriorly, a chitinous edge along the anterior half, but obsolete posteriorly: the anterior ventral surface does not show striation, though posteriorly it is strongly striate, the striae very close, but square-cut, not produced to a point.

Inner cone large, white.

Dimensions: 90 x 45 mm. Average. Type: 114 x 51 mm. Manly Beach.

Habitat: New South Wales.

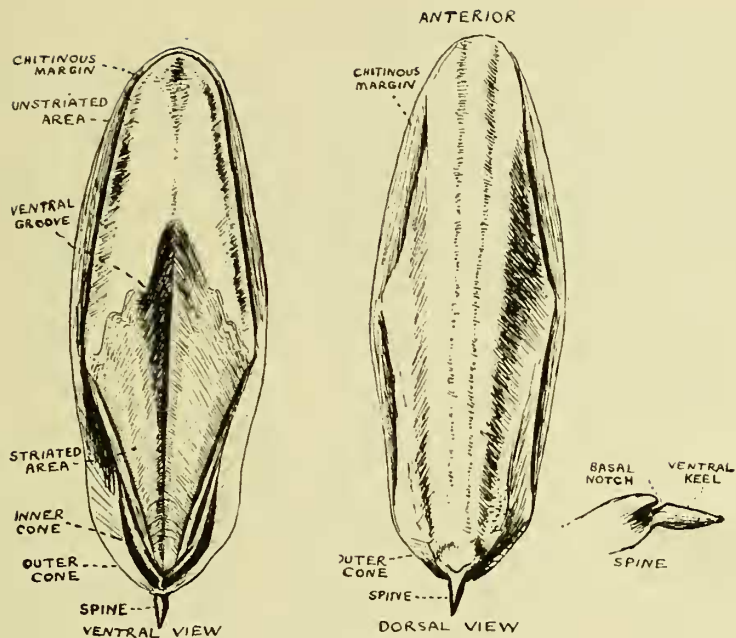


Fig. 7. Diagram of Cuttle-Fish Bone, illustrating terms used in description.

SOLITOSEPIA MESTUS.

Plate xxi., figs. 4-5.

1849. *Sepia mestus* Gray, Cat. Moll. Coll'n Brit. Mus. Cephal., p. 108. Australia.
1886. Hoyle, Rep. Zool. Chall., Vol. xvi., p. 135, figs. in text.
1892. Brazier, Austr. Mus. Cat., No. 15 (Cat. Mar. Shells Austr.) pt. 1, p. 12. P. J.
1918. Hedley, Check List Marine Fauna, N.S.W., Moll. M. 33.

Shell smaller than the preceding, elongate oval, more than twice as long as broad.

Dorsal surface less calcareous, creamy, finely pustulose throughout, similarly indistinctly rayed, outer cone much less calcified, white.

Ventral surface a little more swollen anteriorly, the chitinous edge extending the whole length of the shell, the striae less squarely cut and more wavy, and extending further forward. Spine not produced, noticeably dorsally.

Inner cone large, striated, cream.

Dimensions: 40 x 18 mm. Average. Specimen figured: 57 x 21 mm.

Habitat: New South Wales.

SOLITOSEPIA ROZELLA, n.sp.

Plate xxi., figs. 6-7.

Shell large for the group, elongate oval, narrowed anteriorly, more than twice as long as broad, inner cone prominent coloured, deep ventral sulcus.

Dorsal surface calcareous, rose, finely pustulose with three median ribs, the middle one elevated, the side ones becoming obsolete laterally, diverging anteriorly, chitinous edge exposed about half the length of the shell.

Ventral surface very swollen anteriorly, a very deep broad median sulcus about half its length, absent anteriorly, the chitinous edge present all round but faint posteriorly and well marked in front: the posterior striae are wavy produced in front into a V in agreement with the sulcus.

Inner cone large and coloured, usually deep rose.

Spine short, thick, keeled ventrally and notched basally on the ventral side, swollen dorsally above the notch.

Dimensions: 135 x 47 mm. Type: Manly Beach.

Habitat: New South Wales.

SOLITOSEPIA PLANGON.

Plate xxiii., figs. 3-4.

1849. *Sepia plangon* Gray, Cat. Moll. Coll'n Brit. Mus., Cephal., p. 104. Port Jackson.

1886. Hoyle, Rep. Zool. Chall., Vol. xvi., p. 128, footnote.

1892. Brazier, Austr. Mus. Cat., No. 15 (Cat. Mar. Shells Austr.) pt. 1, p. 11. P. J.

1918. Hedley, Check List Marine Fauna, N.S.W., Moll. M. 33.

Shell medium, narrow, elongately oval, a little narrowed anteriorly, about three times as long as broad, inner cone obsolete, long ventral sulcus.

Dorsal surface calcareous, cream, finely pustulose throughout with a median rib and two fainter ones on each side diverging anteriorly, the chitinous edge exposed along the edges of the shell.

Ventral surface swollen anteriorly, a deep narrow median sulcus extending nearly the whole length, the chitinous edge becoming pronounced posteriorly where it passes in front of the spine: the striae advanced to a point with a fainter notch on each side. Spine keeled, sometimes the keel is obsolete.

Inner cone indistinct, coalescing with the edges of the striated area.

Dimensions: 110 x 30 mm. Specimen figured: Manly Beach.

Habitat: New South Wales.

Genus *MESEMBRISEPIA*, nov.

This genus is introduced for the species I call *M. macandrewi*, which is representative of an Adelaidean group to which *S. chirotrema* Berry belongs. The development of the spine is the characteristic feature in which it differs from *Solitosepia* and suggests a relationship with *Amplisepia*, which may be later discussed. The shell is large for the medium series, elongately oval, inner cone well marked and lengthened, spine round and almost pinched off and directed ventrally.

MESEMBRISEPIA MACANDREWII, n.sp.

Plate xxi., figs. 8-9.

Shell large medium, elongately oval, about three times as long as broad, inner cone very pronounced and lengthened, well marked ventral sulcus, spine rounded.

Dorsal surface calcareous, pinkish cream, outer cone white, rather wide chitinous margin exposed, an indistinct median ridge widening anteriorly, a less marked radial on each side, posteriorly these are defined by means of a lateral shallow gutter: very finely granulated anteriorly, coarsely irregularly pustulose, pustules elevated and lengthening into spiculose objects and vanishing on the base of the spine, which is almost separated from the shell by a deep depression.

Ventral surface swollen in the middle sector of the shell, the anterior portion flattening, the posterior deeply excavate: a wide median sulcus is prominent in the middle sector, obsolete posteriorly: striated area of median length, striae pointed.

Inner cone well developed, white, elongate and broad, finely striate longitudinally, advancing but leaving no marked siphonal depression.

Outer cone large, calcified, extending in front just round the inner cone and leaving a cavity behind from which the spine projects.

Spine long, rounded, directed ventrally.

Dimensions: 170 x 56 mm. Type: Shellharbour. G. MacAndrew.

Habitat: New South Wales.

Remarks: Odd worn shells were found on the Sydney beaches by Whitley and myself, but MacAndrew collected half a dozen, including the perfect one figured. Owing to the pinching in behind the spine most beach shells lack this important feature. This is the Peronian representative of *S. novae-hollandiae* Hoyle, of which *S. chirotrema* Berry appears to be the benthal form.

Genus GLYPTOSEPIA, nov.

The "hones" of this group differ at sight in their colouration, but the marked feature is the loss of the inner cone, a feature of great significance, while the shape of the bone differs and the spine is very long and strongly keeled. On account of the confusion of the earliest named species as hereafter noted I name as type, *G. oipipara*, though in it the features are exaggerated.

The shell is elongately oval, narrowed posteriorly and anteriorly, pinched in and a little attenuated forward: there is no inner cone apparent and there is no ventral sulcus, though the ventral surface is a little swollen anteriorly and the striated area is generally long. Dorsally the surface is coarsely granulose and salmon coloured, the outer cone semi-chitinous, bluish.

The shells belonging to this genus are very brittle and are generally broken when washed up on the beach.

GLYPTOSEPIA OIPIPARA, n.sp.

Plate xxii., figs. 7-8.

Shell large for this group, elongate oval, about twice as long as broad, dorsal sculpture diagnostic, consisting of a median raised curved rib, flattened on each side and angulately carved laterally.

Dorsal surface very coarsely pustulose, flattened like a table, the edges steeply sheering, the table medially adorned with a rounded elevated rib cleanly isolated, and tapering posteriorly where a large chitinous edge is exposed; the whole of the outer cone being chitinous, while a chitinous mantle is spread over the posterior end of the shell.

Ventrally there is no median sulcus, but generally a line indicates its position, while the anterior swelling is more pronounced than in other members of the genus: striated area long, striae rather square-cut: the inner cone is missing as a separate feature, having coalesced with the border of the striated area: the chitinous outer cone advances in front of the spine, which is very long and sharply ventrally keeled.

Dimensions: 132 x 42 mm. Type. Masthead Is., Capricorn Group (Coll. C. Hedley).

Habitat: South Queensland, New South Wales, as far as Sydney (broken shells mostly).

GLYPTOSEPIA GEMELLUS, n.sp.

Plate xxii., figs. 1-2.

Shell medium, broadly elongate oval, about twice as long as broad, a long keeled spine, dorsal surface weakly ribbed, ventral surface anteriorly, little swollen, not sulcate.

Dorsal surface flattened, coarsely granulose throughout, very coarsely posteriorly, finer anteriorly where the shell is pointed and then sinuate laterally, a feature at present seen only in this group: a thin chitinous anterior margin develops posteriorly, so that the outer cone is little calcified and bluish, contrasting with the salmon colour of the rest of the shell.

Ventrally the surface is little swollen anteriorly, there is no median sulcus, the striated area long and the striae rather squarely produced: there is no inner cone and the spine is very long and ventrally keeled.

Dimensions: 96 x 35 mm. Type. Manly Beach.

Habitat: New South Wales.

GLYPTOSEPIA MACILENTA, n.sp.

Plate xxii., figs. 3-4.

Shell very similar to the preceding one, but long and narrow, the width about one-third the breadth.

Shell small for the medium series, narrowly elongate oval, attenuate and laterally sinuate anteriorly, a little narrowed posteriorly.

Dorsal surface finely granulose, a little flattened where a median rib is developed and the edges a little tabulate, diverging anteriorly: a narrow chitinous edge is exposed save at the anterior end, disappearing posteriorly, the outer cone thin, calcareous, bluish, contrasting with the salmon tint of the remainder of the dorsal surface.

Ventral surface little swollen anteriorly, striated area very long and squarish in front: no median sulcus.

Inner cone missing. Spine very long and ventrally keeled.

Dimensions: 92 x 28 mm. Type: Manly Beach.

Habitat: New South Wales.

GLYPTOSEPIA CULTRATA.

Plate xxii., figs. 5-6.

1885. *Sepia cultrata* Hoyle, Ann. Mag. Nat. Hist., Ser. v., Vol. xvi., p. 198, Sept. Off East Coast Austr., St. 163, 2,200 Fathoms.

1886. Hoyle, Rep. Zool. Chall., Vol. xvi., p. 133, pl. xx. Type locality corrected to St. 163 A. off Twofold Bay, N.S.W. 150 fathoms.

1889. Whitelegge, Proc. Roy. Soc. N.S.W., Vol. xxiii., p. 282.

1892. Brazier, Austr. Mus. Cat., No. 15 (Cat. Mar. Shells Austr.)
pt. I., p. 12.

1918. Hedley, Check List Marine Fauna N.S.W., Moll. M. 33.

Hoyle described and figured this species, and the specific name has been since used for other species. A fragment determined as this species by the late E. A. Smith, of the British Museum, proves to belong to a species quite unlike the figure. I have been unable to find a specimen in agreement, even after suggesting that both description and figure are incomplete or imperfect, so have reproduced the figures in this place.

Genus DECORISEPIA, nov.

This genus is introduced for a remarkable species which shows a rounded spine in addition to which it lacks the inner cone, and the "outer cone" is large and scarcely calcareous. Type *D. rex* infra.

DECORISEPIA REX, n.sp.

Plate xxii., figs. 9-10.

Shell large for the medium series, elongately ovoid, narrowed anteriorly, more than twice as long as broad, no inner cone and no ventral sulcus.

Dorsal surface finely pustulose, showing three ribs, the median one rounded, prominent, the lateral ones rounded divergent: a large chitinous margin is exposed which occupies most of the outer cone and advances in front of the spine as a broad horny projection: outer cone only a little calcareous and whitish contrasting with the deep rose of the rest of the shell.

Ventral surface little swollen anteriorly, striated area long, showing no median sulcus, striae rounded.

Inner cone absent, coalescing with the edges of the striated area.

Spine medium, rounded.

Dimensions: 119 x 40 mm. Type: Manly Beach.

Habitat: New South Wales.

Genus ARCTOSEPIA, nov.

A peculiar group of very small narrow shells is known of which the only Australian representative yet described is *Sepia braggi* Verco. The only generic name in existence is *Doratosepion* Rochebrune proposed for the Japanese species *S. andreana* Steenstrup. In Japanese waters more than one generic form appears to exist, and it is suggested that at least a subfamily is necessary to include these Cephalopods. In order to enable correct study of the Australian animals to be undertaken, I therefore propose the new generic name *Arctosepia* and name *A. limata* as type. It is noteworthy that none of this group has yet been noticed in Queensland, and that shells of *A. braggi* are sometimes numerous in southern Australia, a locality whose cuttle fishes otherwise suggest no affinity with those of Japan.

Shells very small, very narrow, ventrally swollen, posteriorly sweeping forward and narrowing, a chitinous outer cone appearing as a hood, the spine rounded and more or less curved, inner cone missing, fusing with the edges of the striated area.

ARCTOSEPIA LIMATA, n.sp.

Plate xxiii., figs. 7-8.

Shell very small, narrowly elongate, attenuate at both ends, more than four times as long as broad, no inner cone nor ventral sulcus, spine rounded.

Dorsal surface calcareous, pink, comparatively smooth, but showing very

regular arched growth lines, an indistinct median elevated rib present, widening a little anteriorly; a very small chitinous edge present but posteriorly this develops into a curious chitinous hood, passing in front of the spine.

Ventral surface swollen anteriorly, no ventral sulcus but a median narrow linear groove present the whole length of the shell, striae rounded, becoming pointed with age: unstriated area a little more than one-fourth the length of the shell: the chitinous edge expands into an outer cone, very little calcified, and presenting a hood-like appearance.

Spine long, thin, rounded, with a slight tendency to curvature dorsally.

Dimensions: 36 x 8 mm. Type: Manly Beach.

Habitat: New South Wales.

Remarks: This is a smaller species than *A. braggi* Verco, which lives in South Australia, Victoria and North Tasmania, proportionately broader, less narrowed posteriorly, different shape, etc.

ARCTOSEPIA VERSUTA, n.sp.

Plate xxiii., figs. 5-6.

Compared with the preceding, this species is smaller and differs more at sight than is indicated by measurement.

Dorsally the median rib is less pronounced, the growth lines more closely packed, the posterior end much less rapidly tapering.

Ventrally the anterior portion is more swollen and posteriorly less excavate: the striae are more numerous, straighter, becoming rounded with age, a longer unstriated area being left.

Spine shorter, rounded, with a strong tendency to curve first dorsally then ventrally.

Dimensions: 33 x 7 mm. Type: Manly Beach.

Habitat: New South Wales.

Genus AMPLISEPIA, nov.

I am introducing this generic name for *Sepia apama* Gray, whose sepion differs entirely from that of the remainder of the Australian species yet known, save its eastern representative *A. verreauxi* Rochebrune. The sepion is very large, elongately oval, tapering posteriorly, broadly rounded anteriorly; the dorsal surface flattened, finely pustulose anteriorly, coarsely granulose posteriorly, the outer cone developed and crassly thickened, the spine missing: ventrally it is very much swollen anteriorly, deeply excavate posteriorly, the outer cone elongated and crassly thickened, the inner cone appearing as an elongate glaze, inside which appears a coarse granulose pustulate development. In the juvenile stages the sepion is more normal, the inner cone well marked, as in *Solitosepia*, and a small spine present.

AMPLISEPIA VERREAUXI.

Plate xxiii., figs. 1-2.

1884. *Ascarosepion verreauxi* Rochebrune, Bull. Soc. Philom. Paris, Series 7, Vol. viii., p. 98. Sydney, N.S.W.
1889. *Sepia apama* Whitelegge, Proc. Roy. Soc. N.S.W., Vol. xxiii., p. 282.
1892. Brazier, Austr. Mus. Cat., No. 15 (Cat. Mar. Shells Austr.) pt. I., p. 11. P. J.
1918. Hedley, Check List Marine Fauna, N.S.W., Moll. M. 33.
- Not *Sepia apama* Gray, Cat. Moll. Coll'n Brit. Mus. Cephal., 1849, p. 103. Port Adelaide, S.A.

The characters of the species are those of the genus, but this form may be distinguished from the Adelaidean type by the narrower inner cone, the smaller phragmocone and the less prolonged mucronal area. It may grow to a larger size, the measurements of the largest one handled up to the present being 465 mm. long by 170 mm. broad, thus surpassing the Japanese *S. hercules*, but larger ones have been noted, but not yet preserved.

Genus ACANTHOSEPION.

Acanthosepion Rochebrune, Bull. Soc. Philom. Paris, Ser. 7, Vol. viii., p. 100, 1884. Type (fide Mayer, Zool. Jahresbericht, 1884). *Sepia aculeata* Hasselt.

This group is well distributed throughout the Indo Malayan Archipelago, and may be regarded as distinctive of that region. Two or three offshoots are known and these will be discussed in a later essay. Meanwhile one of these reaches into northern New South Wales and worn shells are sometimes found on the Sydney beaches. This one is of the medium series, with the inner cone produced ventrally as a ledge: the typical form has the inner cone similarly produced but more pronounced: the spine is not keeled, the dorsal surface rounded, coarsely pustulose, the ventral surface not much swollen anteriorly but deeply excavate posteriorly, a wide shallow sulcus present.

ACANTHOSEPION WHITLEYANUM, n.sp.

Plate xxiii., figs. 9-10.

Shell large for the medium series, broadly elongately oval, anteriorly a little narrowed, more than twice as long as broad, inner cone produced ventrally as a ledge, long shallow wide ventral sulcus.

Dorsal surface coarsely pustulose, pustules larger and massing laterally towards the posterior end but finer adjacent thereto, while the outer cone is finely semi-chitinous: a large chitinous margin is exposed: no definite ribbing is present but an indistinct triangular area may be discerned with indications of a median rib and lateral semi-ribbing.

Ventral surface a little swollen anteriorly and deeply excavate posteriorly, where it becomes as thin as paper, and hence in shells washed up on the beach the spine is generally missing: a shallow wide sulcus extends nearly the whole length of the shell: this is striate, the unstriated area being less than one-fifth the length of the striate, and at its sides a smooth edge is seen: the striated area advances with a rounded elongate sweep.

Inner cone appearing as a faint glaze laterally, but becomes more pronounced posteriorly, sweeping in front of the siphonal cavity to form a small calcareous ledge.

Spine long, rounded, not keeled, produced from a little calcareous rim almost detached from the outer cone.

Dimensions: 168 x 65 mm. Type: Port Macquarie, New South Wales (H. S. Mort).

Habitat: New South Wales.

Note.—The beautiful illustrations which adorn this essay have been prepared by Miss Joyce K. Allan, of the Australian Museum, and present a series hitherto unequalled in any previous publication. The author's thanks are here tendered with the knowledge that whether his conclusions be wholly accepted or not, the accurate figures will mark a milestone of progress of inestimable value to workers in every land. The shells figured, and long series supporting the results, are in the Australian Museum, being presented by the various collectors already named. The series show in many cases growth stages from a few millimetres to extreme age, and these have been utilised and will be fully described in the larger essay.

EXPLANATION OF PLATES.

Plate xxi.

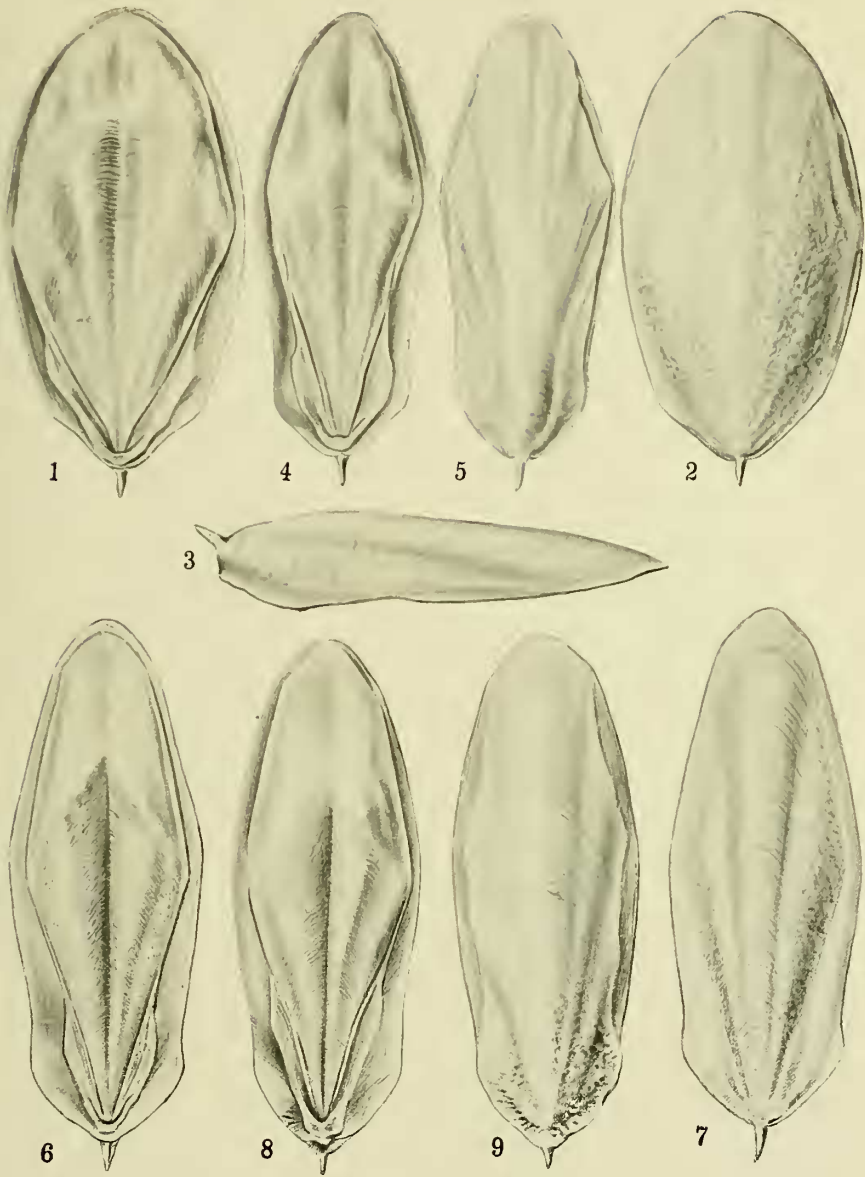
- Fig. 1. Ventral surface of *Solitosepia liliana* Iredale.
 2. Dorsal surface.
 3. Side view.
 4. Ventral surface of *Solitosepia mestus* Gray.
 5. Dorsal surface.
 6. Ventral surface of *Solitosepia rozella* Iredale.
 7. Dorsal surface.
 8. Ventral surface of *Mesembrisepia macandrewi* Iredale.
 9. Dorsal surface.

Plate xxii.

- Fig. 1. Ventral surface of *Glyptosepia gemellus* Iredale.
 2. Dorsal surface.
 3. Ventral surface of *Glyptosepia macilenta* Iredale.
 4. Dorsal surface.
 5. Dorsal surface of *Glyptosepia cultrata* Hoyle.
 6. Ventral surface.
 7. Ventral surface of *Glyptosepia opipara* Iredale.
 8. Dorsal surface.
 9. Dorsal surface of *Decorisepia rex* Iredale.
 10. Ventral surface.

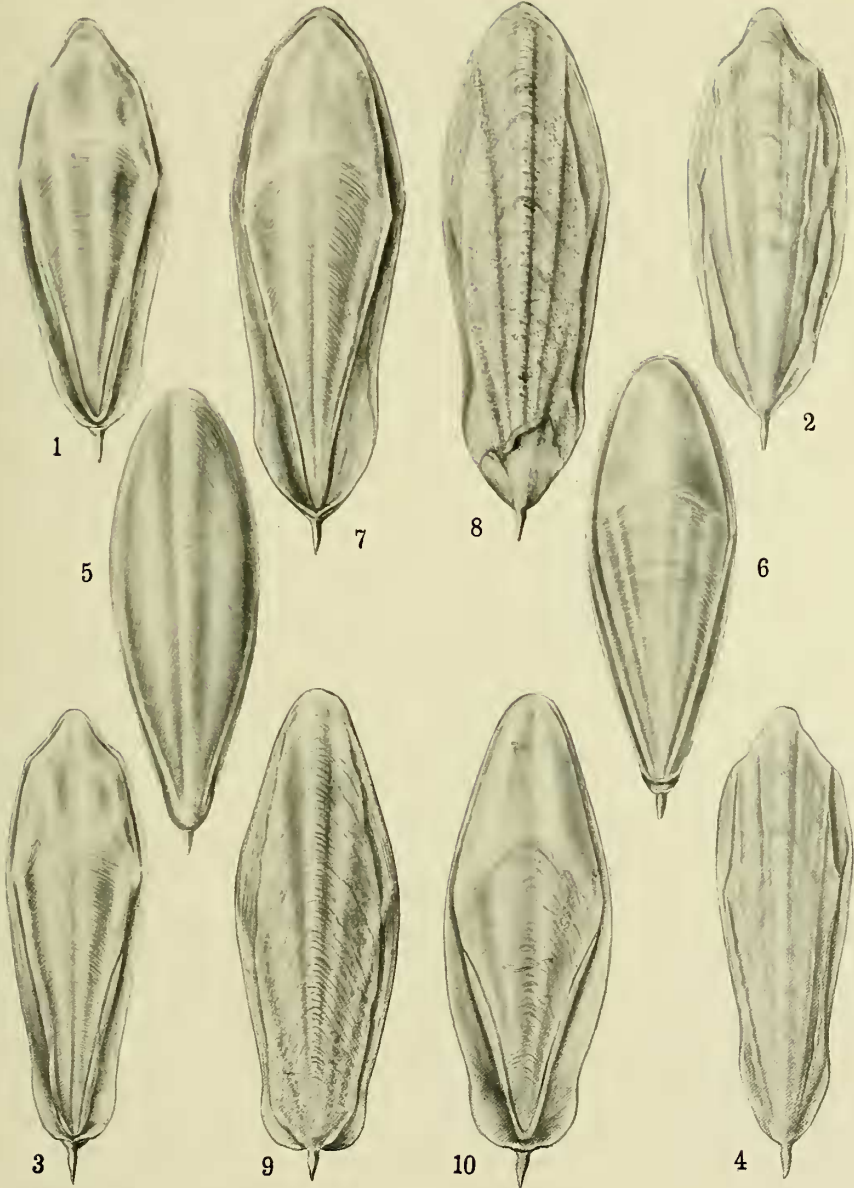
Plate xxiii.

- Fig. 1. Ventral surface of *Amplisepia verreauxi* Rochebrune.
 2. Dorsal surface.
 3. Dorsal surface of *Solitosepia plangon* Gray.
 4. Ventral surface.
 5. Dorsal surface of *Arctosepia versuta* Iredale.
 6. Ventral surface.
 7. Dorsal surface of *Arctosepia limata* Iredale.
 8. Ventral surface.
 9. Dorsal surface of *Acanthosepion whileyanum* Iredale.
 10. Ventral surface.



Drawn by Joyce K. Allan.

Australian Cuttle-Fish Bones.



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Australian Cuttle-Fish Bones.



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Australian Cuttle-Fish Bones.